US011327698B2

(12) **United States Patent**
Anno

(10) **Patent No.: US 11,327,698 B2**
(45) **Date of Patent: May 10, 2022**

(54) **METHOD, SYSTEM AND APPARATUS FOR CLOUD-BASED PRINTING**

(71) Applicant: **ZEBRA TECHNOLOGIES CORPORATION**, Lincolnshire, IL (US)

(72) Inventor: **Bret M. Anno**, Mundelein, IL (US)

(73) Assignee: **Zebra Technologies Corporation**, Lincolnshire, IL (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **16/912,393**

(22) Filed: **Jun. 25, 2020**

(65) **Prior Publication Data**

US 2021/0405935 A1 Dec. 30, 2021

(51) **Int. Cl.**
G06F 3/12 (2006.01)
H04N 1/00 (2006.01)

(52) **U.S. Cl.**
CPC ***G06F 3/126*** (2013.01); ***G06F 3/1296*** (2013.01); ***H04N 1/00244*** (2013.01)

(58) **Field of Classification Search**
CPC G06F 3/126; G06F 3/1296; H04N 1/00244
USPC 358/1.15
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

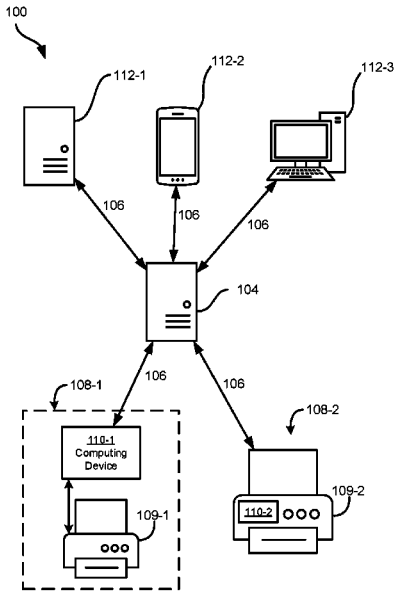
9,335,958 B2 5/2016 Anno et al.
2002/0049837 A1* 4/2002 Kato G06F 3/1259 709/223
2003/0005100 A1* 1/2003 Barnard H04L 29/12113 709/223
2007/0013941 A1 1/2007 Anno
2010/0220355 A1* 9/2010 Sugiyama G06F 3/1222 358/1.15
2011/0279861 A1* 11/2011 Scheller G06F 3/1287 358/1.15
2011/0286026 A1* 11/2011 Matsuzawa G06F 3/1222 358/1.14
2012/0188583 A1* 7/2012 Stone G06F 3/1222 358/1.14
2016/0142568 A1* 5/2016 Nakamura H04N 1/00103 358/1.15
2016/0182604 A1 6/2016 Ensign et al.
2017/0115935 A1* 4/2017 Yokozawa H04N 1/00204
2019/0212950 A1* 7/2019 Schloesser G06F 3/121
2019/0250865 A1* 8/2019 Takigawa G06F 3/1203
2019/0265929 A1* 8/2019 Kitagata G06F 3/1267
2019/0286377 A1* 9/2019 Nishida G06F 3/1205
2020/0073608 A1* 3/2020 Tanaka G06F 3/1288
(Continued)

Primary Examiner — Jerome Grant, II

(57) **ABSTRACT**

A server includes: a memory storing printing configuration rules for interfacing with a printing system; a communications interface configured to communicate with a client device; a processor interconnected with the memory and the communications interface, the processor configured to: generate a print system network identifier mapped to the printing system, the print system network identifier configured for identifying print parameters for print jobs; receive, via the communications interface, a print request from the client device, the print request generated based on the print system network identifier and including one or more print parameters for a print job; and send a print instruction to the printing system to initiate the print job at the printing system according to the one or more print parameters, the print instruction generated according to the printing configuration rules.

21 Claims, 6 Drawing Sheets



(56) **References Cited**

U.S. PATENT DOCUMENTS

2020/0278815	A1*	9/2020	Li	G06F 3/1226
2020/0310698	A1*	10/2020	Gardner	G06F 3/1267
2020/0310699	A1*	10/2020	Minami	G06F 3/1262

* cited by examiner

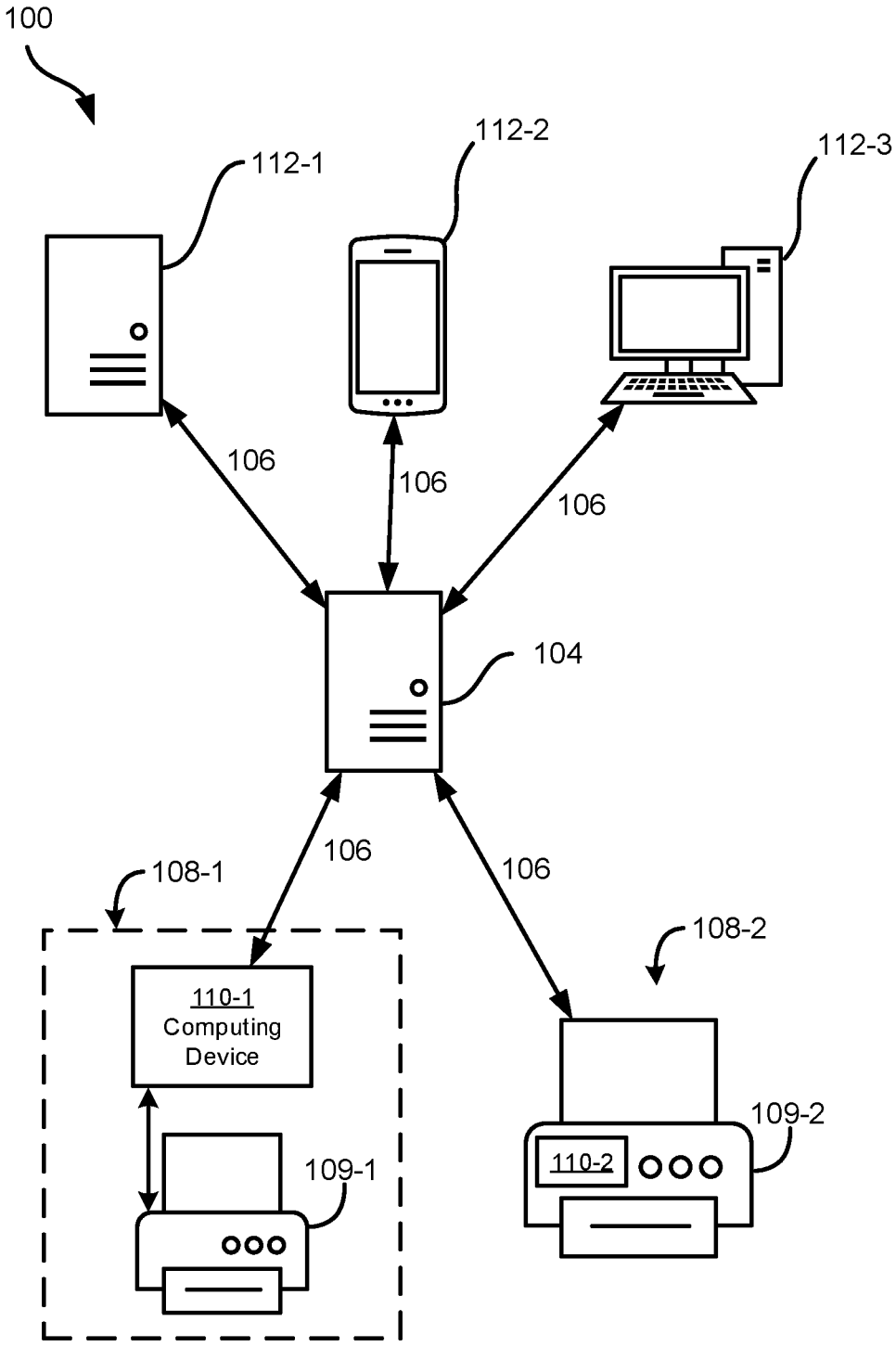

100
112-1
112-2
112-3
106
106
106
104
106
106
108-1
108-2
110-1
Computing
Device
109-1
109-2
110-2

FIG. 1

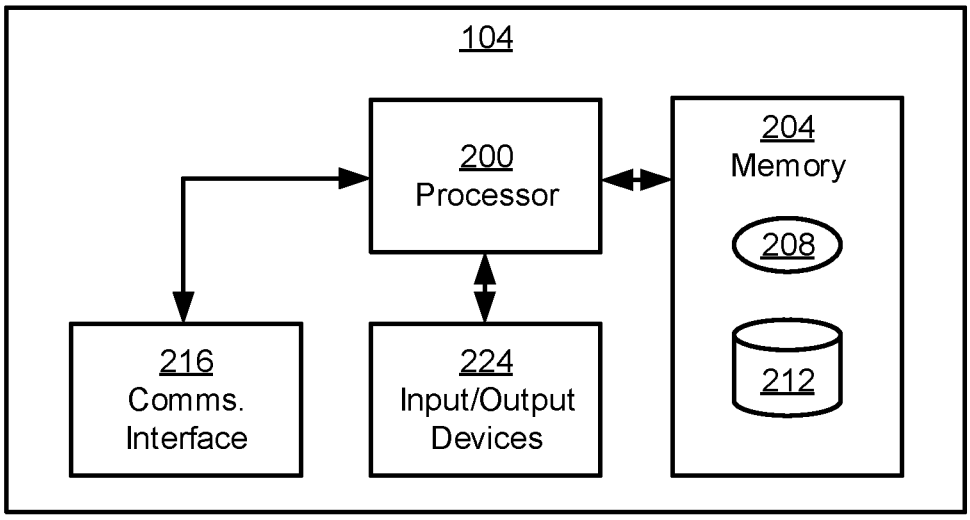

104
200
Processor
204
Memory
208
212
216
Comms.
Interface
224
Input/Output
Devices

FIG. 2

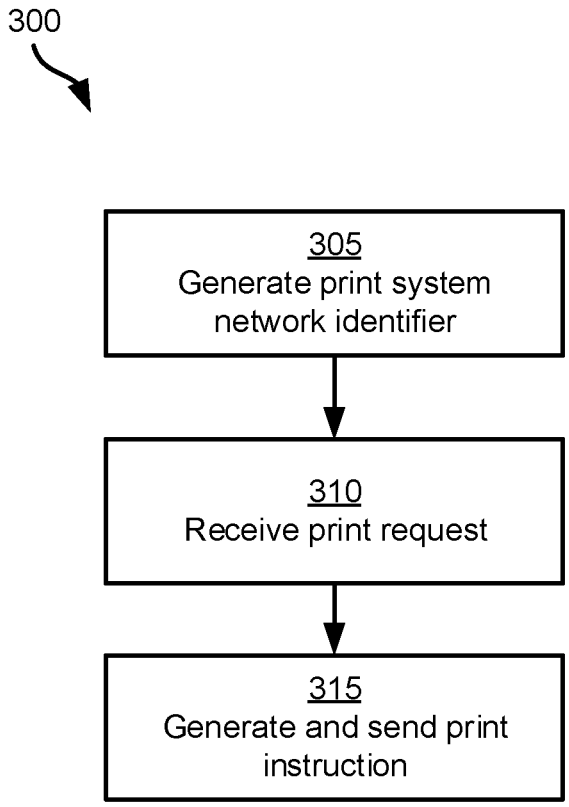

300
305
Generate print system network identifier
310
Receive print request
315
Generate and send print instruction

FIG. 3

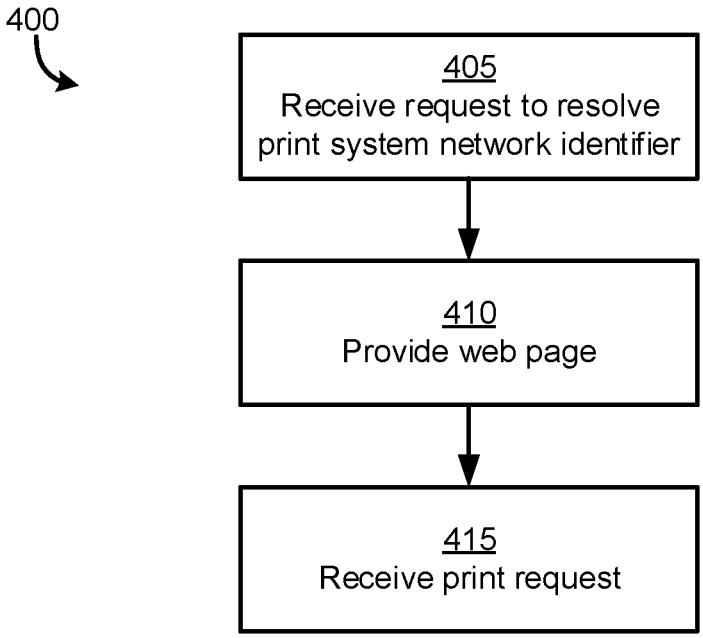

400
405
Receive request to resolve print system network identifier
410
Provide web page
415
Receive print request

FIG. 4A

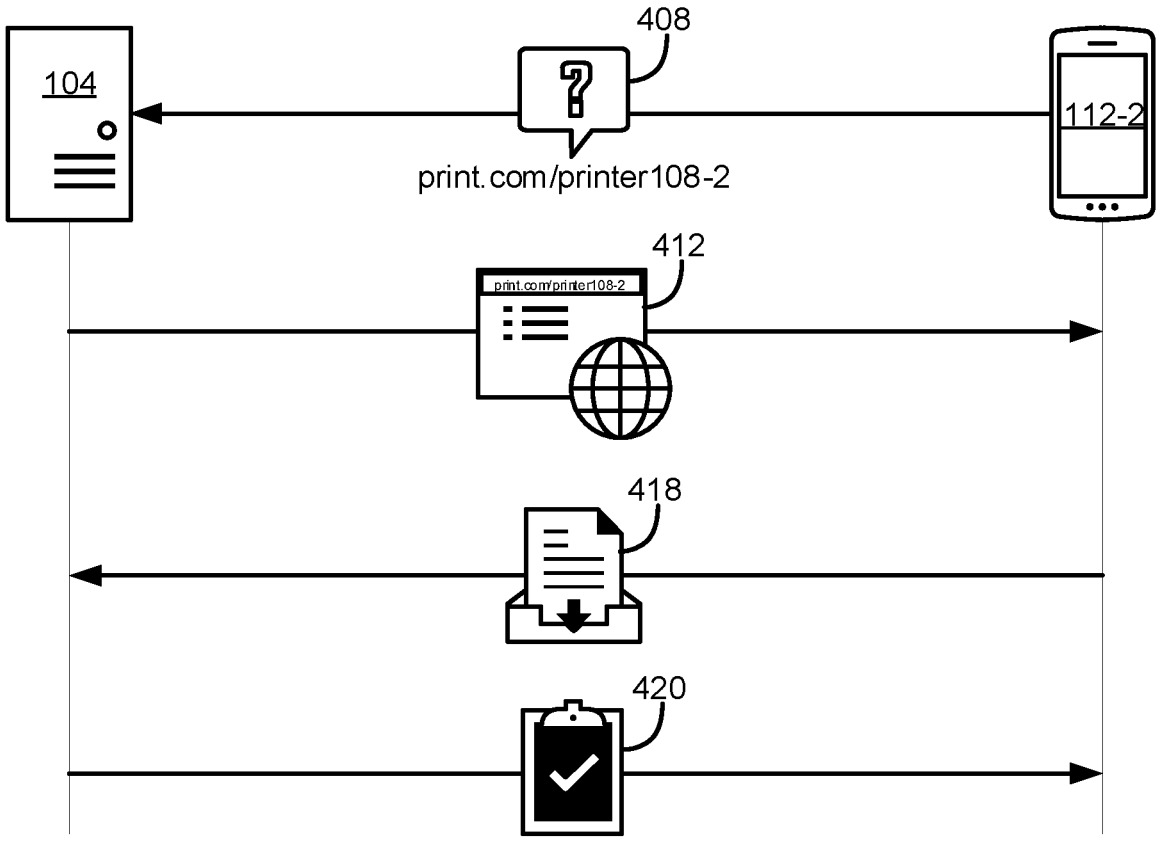

104
408
print.com/printer108-2
112-2
412
print.com/printer108-2
418
420

FIG. 4B

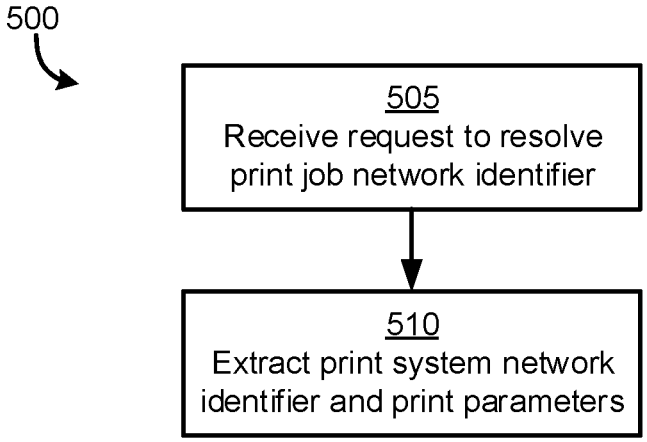

500
505
Receive request to resolve print job network identifier
510
Extract print system network identifier and print parameters

FIG. 5A

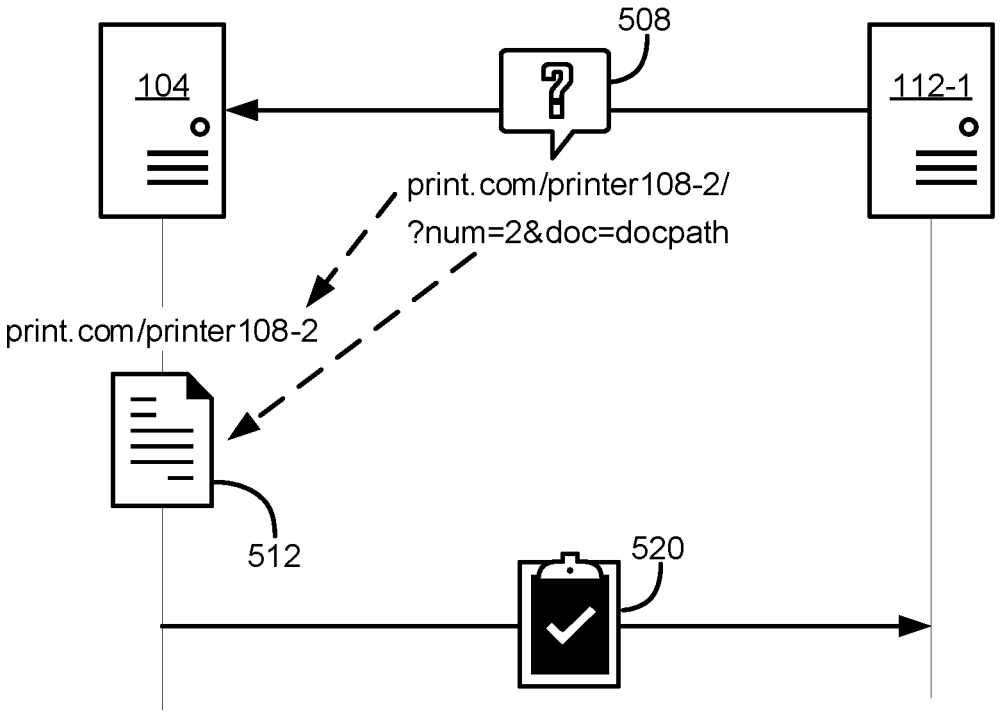

508
104
112-1
print.com/printer108-2/
?num=2&doc=docpath
print.com/printer108-2
512
520

FIG. 5B

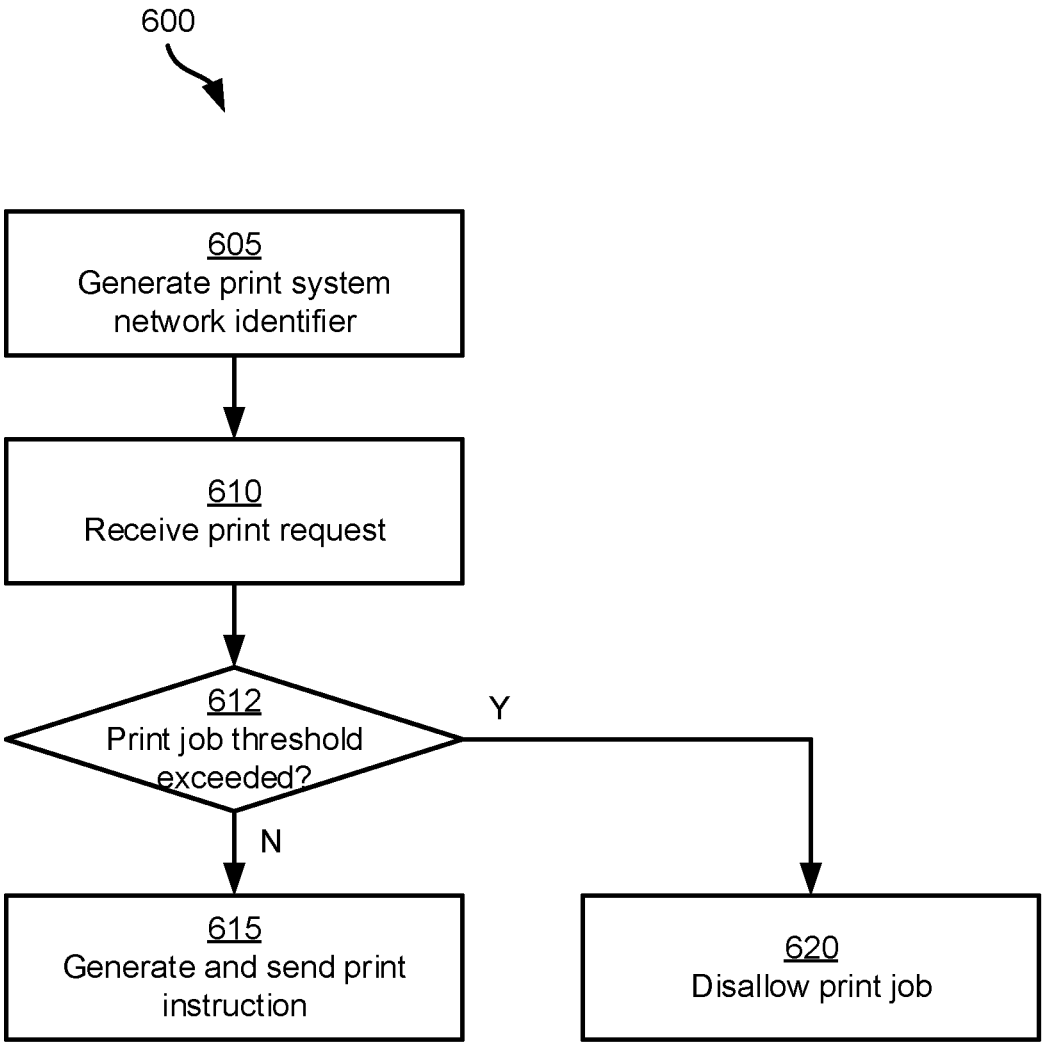

600
605
Generate print system network identifier
610
Receive print request
612
Print job threshold exceeded?
Y
N
615
Generate and send print instruction
620
Disallow print job

FIG. 6

METHOD, SYSTEM AND APPARATUS FOR CLOUD-BASED PRINTING

BACKGROUND

Printing data from a computing device typically involves transmitting the data to a local printer, e.g. connected directly to the computing device or to a local network that includes the computing device. Print resources may be inaccessible to a computing device from outside such local networks, or may be accessible via multiple stages of communications between the computing device and various other devices, e.g. to gain access to the local networks.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

The accompanying figures, where like reference numerals refer to identical or functionally similar elements throughout the separate views, together with the detailed description below, are incorporated in and form part of the specification, and serve to further illustrate embodiments of concepts that include the claimed invention, and explain various principles and advantages of those embodiments.

FIG. **1** is a diagram illustrating cloud-based printing system.

FIG. **2** is a block diagram of certain internal hardware components of the server of FIG. **1**.

FIG. **3** is a flowchart of a method of cloud-based printing.

FIG. **4**A is a flowchart of an example implementation of block **310** of the method of FIG. **3**.

FIG. **4**B is a schematic diagram of the flow of data during the method of FIG. **4**A.

FIG. **5**A is a flowchart of another example implementation of block **310** of the method of FIG. **3**.

FIG. **5**B is a schematic diagram of the flow of data during the method of FIG. **5**A.

FIG. **6** is a flowchart of another method of cloud-based printing.

Skilled artisans will appreciate that elements in the figures are illustrated for simplicity and clarity and have not necessarily been drawn to scale. For example, the dimensions of some of the elements in the figures may be exaggerated relative to other elements to help to improve understanding of embodiments of the present invention.

The apparatus and method components have been represented where appropriate by conventional symbols in the drawings, showing only those specific details that are pertinent to understanding the embodiments of the present invention so as not to obscure the disclosure with details that will be readily apparent to those of ordinary skill in the art having the benefit of the description herein.

DETAILED DESCRIPTION

Examples disclosed herein are directed to a server including a memory storing printing configuration rules for interfacing with a printing system; a communications interface configured to communicate with a client device; a processor interconnected with the memory and the communications interface, the processor configured to: generate a print system network identifier mapped to the printing system, the print system network identifier configured for identifying print parameters for print jobs; receive, via the communications interface, a print request from the client device, the print request generated based on the print system network identifier and including one or more print parameters for a print job; and send a print instruction to the printing system to initiate the print job at the printing system according to the one or more print parameters, the print instruction generated according to the printing configuration rules.

Additional examples disclosed herein are directed to a method comprising: storing printing configuration rules for interfacing with a printing system; generating a print system network identifier mapped to the printing system, the print system network identifier configured for identifying print parameters for print jobs; receiving a print request from the client device, the print request generated based on the print system network identifier and including one or more print parameters for a print job; and sending a print instruction to the printing system to initiate the print job at the printing system according to the one or more print parameters, the print instruction generated according to the printing configuration rules.

Further examples disclosed herein are directed to a non-transitory computer-readable medium storing a plurality of computer-readable instructions executable by a processor, wherein execution of the instructions configures the processor to: generate a print system network identifier mapped to the printing system, the print system network identifier configured for identifying print parameters for print jobs; receive, via the communications interface, a print request from the client device, the print request generated based on the print system network identifier and including one or more print parameters for a print job; and send a print instruction to the printing system to initiate the print job at the printing system according to the one or more print parameters, the print instruction generated according to printing configuration rules stored in a memory.

FIG. **1** depicts an example system **100** for cloud-based printing. The system **100** includes a server **104**, printing systems **108-1**, **108-2**, and client devices **112-1**, **112-2**, **112-3**. The printing systems **108**, and the client devices **112** are connected to the server **104** via communication links **106**. The system **100** enables cloud- or web-based printing, and hence the communication links **106** may utilize suitable wide area networks (WAN), including cellular networks and the Internet. The communication links **106** may further utilize local area networks defined by one or more routers, switches, wireless access points, or the like.

The server **104** provides a cloud-based printing service so that a connected client device **112** may print to a printing system **108** via the server **104**. More specifically, the server **104** is configured to enable cloud printing without requiring account creation or authentication. To enable this, the server **104** maps print system network identifiers (e.g., a uniform resource locator or URL) to each printing system **108**. The print system network identifier is configured for identifying print parameters for print jobs. That is, print jobs may be initiated directly using the print system network identifier and may be processed without requiring authentication by the requesting client device **112**. Thus, the print system network identifier is also configured to bypass authentication at the server **104**.

In operation, the server **104** generates at least one print system network identifier for each printing system **108** registered with the server **104**. Each print system network identifier maps to a corresponding printing system **108** and is configured for identifying print parameters for the print job. That is, the print system network identifier allows the print parameters for a print job to be specified at the client devices **112**. For example, the print system network identifier may correspond to a web page in which end users may input print parameters, submission of which acts as a print

request when received at the server **104**. Alternately, the print parameters may be appended as variables to the print system network identifiers to form a print job network identifier, which acts as a print request when received at the server **104**. Thus, access to the print system network identifiers enables print requests to be directly generated based on the print system network identifier.

The print system network identifiers may therefore be shared or distributed, including to third parties to reduce the number of back-and-forth communications required between the parties. For example, in a conventional model, an end user may request and download a document from a third party, and then generate a print request to print the document. In the present example, the end user may provide the print system network identifier to the third party. The third party may then generate the print request to print the document using the print system network identifier directly, and without the end user downloading the document. Advantageously, since the print request is generated using the print system network identifier directly, the third party may bypass authentication requirements with the server **104** and proceed to generate the print request.

The printing systems **108** may include any suitable systems configured to communicate with the server **104** via the communication links **106** and to print documents or other data. For example, the printing system **108-1** includes a printer **109-1** and a separate computing device **110-1**, such as a laptop computer, a desktop computer, a print server, or the like, which is interconnected with the printer **109-1** to bridge between the printer **109-1** and network communications with the server **104**. The printing system **108-2** includes a cloud-enabled printer **109-2** having an integrated printer communications interface **110-2** to allow the printer **109-2** to communicate directly with the server **104**.

The client devices **112** may be computing devices, such as desktop computers, laptop computers, mobile devices, kiosks, other servers, tablets, or other suitable computing devices. In particular, the client devices **112** are configured to communicate with the server **104** via the communication links **106** to initiate print jobs at one of the printing systems **108**. The client devices **112** include suitable hardware (e.g., including communication interfaces, processors, memories, user interfaces, and the like) to enable the functionality described herein. For example, the client devices **112** may implement a web browser application to access the print system network identifier and to allow the user to input print parameters for a particular print job.

Referring to FIG. **2**, the server **104**, including certain internal components, is shown in greater detail. The server **104** includes a processor **200** interconnected with a non-transitory computer-readable storage medium, such as a memory **204**. The memory **204** includes a combination of volatile memory (e.g. Random Access Memory or RAM) and non-volatile memory (e.g. read only memory or ROM, Electrically Erasable Programmable Read Only Memory or EEPROM, flash memory). The processor **200** and the memory **204** may each comprise one or more integrated circuits.

The memory **204** stores computer-readable instructions for execution by the processor **200**. In particular, the memory **204** stores a control application **208** which, when executed by the processor **200**, configures the processor **200** to perform various functions discussed below in greater detail and related to the printing operation of the server **104**. The application **208** may also be implemented as a suite of distinct applications. The processor **200**, when so configured by the execution of the application **208**, may also be referred to as a controller **200**.

Those skilled in the art will appreciate that the functionality implemented by the processor **200** may also be implemented by one or more specially designed hardware and firmware components, such as a field-programmable gate array (FPGAs), application-specific integrated circuits (ASICs) and the like in other embodiments. In an embodiment, the processor **200** may be, respectively, a special purpose processor which may be implemented via dedicated logic circuitry of an ASIC, an FPGA, or the like in order to enhance the processing speed of the dimensioning operations discussed herein.

The memory **204** also includes a repository **212** storing rules and data for printing operations. For example, the repository **212** may define, for each printing system **108**, a print system network identifier, printing configuration rules, and other data pertaining to the printing system **108** (e.g., a nickname, print job thresholds, or the like). The printing configuration rules may include driver interfaces, communication protocols for sending print parameters and print data, or the like. In particular, each printing system **108** may have different printing configuration rules, and hence the repository **212** may define appropriate printing configuration rules for each printing system **108**.

The server **104** also includes a communications interface **216** interconnected with the processor **200**. The communications interface **216** includes suitable hardware (e.g. transmitters, receivers, network interface controllers and the like) allowing the server **104** to communicate with other computing devices—such as the printing systems **108** and the client devices **112**—via the links **106**. The specific components of the communications interface **216** are selected based on the type of network or other links that the server **104** is to communicate over. The server **104** can be configured, for example, to communicate with the client devices **112** to receive print requests, and to send print instructions to the printing systems **108**.

The processor **200** may also be connected to one or more input and/or output devices **224**. The input devices **224** can include one or more keyboards, mice, touch-sensitive display screens or the like. The output devices **224** can further include one or more display screens, sound generators, or the like for providing output or feedback to an operator.

The functionality of the server **104**, as implemented via execution of the applications **208** by the processor **200** will now be described in greater detail, with reference to FIG. **3**. FIG. **3** illustrates a method **300** of cloud-based printing, which will be described in conjunction with its performance in the system **100**, and in particular, by the server **104**, with reference to the components illustrated in FIGS. **1** and **2**. In other examples, the method **300** may be performed in other suitable systems.

At block **305**, the server **104** generates a print system network identifier corresponding to each of the printing systems **108** associated with the server **104**.

For example, the server **104** may host a cloud-printing service available at the network identifier "print.com". When the printing system **108-1** is registered with the cloud-printing service hosted by the server **104**, the server **104** may generate a print system network identifier "print.com/printer108-1" mapped to the printing system **108-1**. Similarly, when the printing system **108-2** is registered with the cloud-printing service hosted by the server **104**, the server **104** may generate another print system network identifier "print.com/printer108-2" mapped to the printing

system **108-2**. In some examples, network identifier may include a token to map to a given printing system (i.e., "printer108-1" or "printer108-2" in the present examples) which is sufficiently long, or has a sufficient number of bytes such that randomly accessing said network identifier is computationally hard. The print system network identifiers may thus serve to identify the appropriate printing system, as will be described further herein. The print system network identifiers are also configured for identifying print parameters for print jobs, as will be described further below. The server **104** may then store associations between the print system network identifiers, the printing systems, and the printing configuration rules for interfacing with the printing systems.

In some examples, at block **305**, the server **104** may further provide the print system network identifiers to the client devices **112**. For example, the print system network identifiers may be provided at a central web page (e.g., at "print.com/printer-list") for look-up by the client devices **112**. Accordingly, when a user operating the client device **112-2** uses a web browser application to access "print.com/printer-list", the server **104** may provide the corresponding web page, listing the printing systems **108** for selection. In some examples, users may be required to authenticate or log in prior to viewing the list of printing systems **108** available for selection. The printing systems **108** may further be associated with a nickname and/or a description to allow the end users to differentiate the printing systems **108-1** and **108-2**. For example, the printing system **108-1** may be associated with the description "black and white printer" while the printing system **108-2** may be associated with the description "color printer". The listing may further include a status indicators and other printing system status information for each of the printing systems **108**. For example, if the computing device **110-1** is offline, the printing system **108-1** may be unavailable. Other printing system status information may include, for example, a current queue length for documents queued to be printed.

The user may then select a printing system **108** at the client device **112-2**, which generates a network identifier request. Responsive to the network identifier request, the server **104** may retrieve and provide the stored print system network identifier of the selected printing systems **108** and present it on the web page.

In other examples, rather than retrieving and providing the stored print system network identifier of the selected printing systems **108**, responsive to each network identifier request, the server **104** may generate a new print system network identifier mapped to the printing system for each subsequent network identifier request. Thus, for example, new print system network identifier for the printing system **108-1** may include "print.com/printer108-1/req2", "print.com/printer108-1/req3" and so on. The new print system network identifiers similarly identify the corresponding printing system **108** and are configured for identifying print parameters for print jobs. The new print system network identifiers are further configured to bypass authentication at the server **104**. Thus, the server **104** may map many print system identifiers to each printing system **108**.

Other criteria for generating new print system network identifiers are also contemplated. For example, the server **104** may generate new print system network identifiers based on distinct user identifiers, internet protocol (IP) addresses, or other suitable criteria. For example, users may log in or otherwise be authenticated in the system **100**, and hence the server **104** may assign a unique print system network identifier to each user identifier. In further examples, rather than retrieving and providing the stored print system network identifier for the selected printing system **108**, the web page listing the printing systems **108** may also directly present the print system network identifiers corresponding to the listed printing systems **108**.

At block **310**, the server **104** receives a print request, for example from the client device **112**. Specifically, the print request is generated based on the print system network identifier and includes one or more print parameters for a print job. For example, the print system network identifier may correspond to a web page configured to receive the one or more print parameters for the print job. In particular, submission of the print parameters at the web page may act as the print request to the server **104**. In other examples, the print request may correspond to a print job network identifier which includes the one or more print parameters appended to the print system network identifier.

For example, referring to FIGS. **4**A and **4**B an example method **400** of receiving a print request and a schematic of the method **400** are depicted. In particular, in the example method **400**, the print system network identifier corresponds to a web page configured to receive the one or more print parameters for the print job.

At block **405**, the server **104** receives a request **408** to resolve the print system network identifier. In particular, a user of the client device **112-2** may use a web browser application to access the network identifier "print.com/printer108-2". Accordingly, the client device **112-2** generates the request **408** to resolve the URL. According to standard communication protocols, the request **408** may be sent to the server **104**, which hosts the network identifier "print.com", to be resolved.

At block **410**, the server **104** resolves the request **408**, and provides, to the client device **112-2**, a web page **412** corresponding to the network identifier "print.com/printer108-2". The web page **412** is configured to receive print parameters for the print job. For example, the web page **412** may be a form or the like, to allow the user to specify the number of copies of the document and other parameters of the print job. To identify the document to be printed, the web page **412** may accept uploads, or another network identifier (e.g., a URL) indicating the path of the document.

At block **415**, the server **104** receives, via a submission request at the web page **412**, a print request **418** including the one or more parameters input at the web page **412** for the print job. For example, once the user has input the print parameters at the web page **412**, the user may select a "submit" button on the web page **412** to initiate the submission request. Thus, the print request **418** including the one or more parameters is submitted to the server **104**. In some examples, after successfully receiving the print request **418**, the server **104** may return a status indicator **420** to the client device **112-2**. For example, the status indicator **420** may simply indicate the success or failure of transmission of the print request **418** to the server **104**. In other examples, the status indicator **420** may be dynamic, and may be updated according to the progress of the print job (e.g., the print job is being transmitted to the printer, the printer is printing, the print job is complete).

Turning now to FIGS. **5**A and **5**B, another example method **500** of receiving a print request and a schematic of the method **500** are depicted. In particular, in the example method **500**, the print parameters are to be appended to the print system network identifier to define a print job network identifying forming the print request.

At block **505**, the server **104** receives a request **508** to resolve a print job network identifier. In particular, the client

device **112-1** may generate the print job network identifier by taking the print system network identifier and appending print parameters as variables to the print system network identifier. The print parameters may specify, for example, the number of copies of the document (e.g., "num=2") and other parameters of the print job. To identify the document to be printed, an embedded network identifier may be included to indicate the path of the document (e.g., "doc=docpath"). The print system network identifier and the parameters may thus be appended to form the print job network identifier "print.com/printer108-2/?num=2&doc=docpath". The client device **112-1** may then generate the request **508** to resolve the URL. According to standard communication protocols, the request **508** may be sent to the server **104**, which hosts the network identifier "print.com", to be resolved.

At block **510**, the server **104** resolves the request **508** and extracts the print system network identifier and print parameters **512** from the print job network identifier. The request **508** to resolve the print job network identifier thus acts as the print request for a print job having the print parameters **512**. In some examples, after successfully resolving the request **508** and extracting the print parameters **512** for the print job, the server **104** may return a status indicator **520** to the client device **112-1**. For example, the status indicator **520** may indicate the success or failure of the resolution of the request **508** and the extraction of the print parameters **512**. In other examples, the status indicator **520** may be dynamic, and may be updated according to the progress of the print job (e.g., the print job is being transmitted to the printer, the printer is printing, the print job is complete).

In some examples, the server **104** may accommodate both the methods **400** and **500** to receive print requests. For example, users operating the mobile computing device **112-2**, or the desktop computer **112-3** may use the method **400** as it provides a more user-friendly interface to input print parameters and generate the print request. Thus, a user desiring to print a document locally saved at the client devices **112-2** or **112-3** may access the web page corresponding to the print system network identifier "print.com/printer108-2", upload the document, and input the print parameters at the web page to generate the print request.

In contrast, the server **112-1** may automatically interface with the server **104**, and hence it may be programmatically simpler to append print parameters to the print system network identifier to form a print job network identifier to generate the print request. For example, a user may desire to print a packaging label from "stamps.com", hosted at the server **112-1**. Rather than downloading the packaging label from "stamps.com" and uploading the packaging label to the web page corresponding to "print.com/printer108-2", the user may provide to the server **112-1** the print system network identifier "print.com/printer108-2". In some examples, the user may further provide to the server **112-1** print parameters for the print job. The server **112-1** may then translate the print parameters and the network identifier for the packaging label into suitable variables to be appended to the print system network identifier to form the print job network identifier "print.com/printer108-2/?num=2&doc=docpath" for submission to the server **104** to generate the print request.

Returning now to FIG. **3**, at block **315**, the server **104** generates and sends a print instruction to the appropriate printing system **108**. In particular, the server **104** generates the print instruction according to the printing configuration rules stored in the memory **204**. The print instruction initiates the print job according to the print parameters received with the print request at block **310**. In some examples, during or after the printing system **108** is executing the print job, the server **104** may receive a status indicator from the printing system **108** and may pass the status indication along to the requesting client device **112**.

In some examples, prior to generating the print instruction, the server **104** may perform one or more checks to ensure that print job thresholds have not been exceeded. For example, referring to FIG. **6**, an example method **600** of cloud-based printing including a check of print job thresholds. The method **600** is similar to the method **300**, and like blocks are similarly numbered.

In particular, at block **605**, the server **104** generates a print system network identifier. At block **610**, the server **104** receives a print request from a client device **112**, for example, by methods **400** or **500**.

Prior to generating the print instruction, at block **612**, the server **104** checks whether a print job threshold has been exceeded. For example, the server **104** may maintain, in the memory **204**, a count of print jobs requested by an IP address over a predefined time interval (e.g., number of print jobs requested within the past 10 hours, 24 hours, 7 days, or the like). To reduce misuse of the system, the server **104** may compare the count of print jobs requested by the IP address to a threshold number of print jobs for the predefined time interval. When the count exceeds the threshold number of print jobs, the determination at block **612** is affirmative, and the server **104** proceeds to block **620**. When the count does not exceed the threshold number of print jobs, the determination at block **615** is negative and the server **104** proceeds to block **615**. In other examples, the server **104** may alternately or additionally implement other criteria for managing print jobs.

At block **615**, the server **104** generates and sends the print instruction based on the printing configuration rules and the print parameters.

At block **620**, the server **104** disallows the print request and any further print jobs from the IP address. The server **104** may return a notification to the client device, for example, indicating that the maximum number of print jobs for the predefined time interval has been reached.

In the foregoing specification, specific embodiments have been described. However, one of ordinary skill in the art appreciates that various modifications and changes can be made without departing from the scope of the invention as set forth in the claims below. Accordingly, the specification and figures are to be regarded in an illustrative rather than a restrictive sense, and all such modifications are intended to be included within the scope of present teachings.

The benefits, advantages, solutions to problems, and any element(s) that may cause any benefit, advantage, or solution to occur or become more pronounced are not to be construed as a critical, required, or essential features or elements of any or all the claims. The invention is defined solely by the appended claims including any amendments made during the pendency of this application and all equivalents of those claims as issued.

Moreover in this document, relational terms such as first and second, top and bottom, and the like may be used solely to distinguish one entity or action from another entity or action without necessarily requiring or implying any actual such relationship or order between such entities or actions. The terms "comprises," "comprising," "has", "having," "includes", "including," "contains", "containing" or any other variation thereof, are intended to cover a non-exclusive inclusion, such that a process, method, article, or apparatus that comprises, has, includes, contains a list of elements does

not include only those elements but may include other elements not expressly listed or inherent to such process, method, article, or apparatus. An element proceeded by "comprises . . . a", "has . . . a", "includes . . . a", "contains . . . a" does not, without more constraints, preclude the existence of additional identical elements in the process, method, article, or apparatus that comprises, has, includes, contains the element. The terms "a" and "an" are defined as one or more unless explicitly stated otherwise herein. The terms "substantially", "essentially", "approximately", "about" or any other version thereof, are defined as being close to as understood by one of ordinary skill in the art, and in one non-limiting embodiment the term is defined to be within 10%, in another embodiment within 5%, in another embodiment within 1% and in another embodiment within 0.5%. The term "coupled" as used herein is defined as connected, although not necessarily directly and not necessarily mechanically. A device or structure that is "configured" in a certain way is configured in at least that way, but may also be configured in ways that are not listed.

It will be appreciated that some embodiments may be comprised of one or more specialized processors (or "processing devices") such as microprocessors, digital signal processors, customized processors and field programmable gate arrays (FPGAs) and unique stored program instructions (including both software and firmware) that control the one or more processors to implement, in conjunction with certain non-processor circuits, some, most, or all of the functions of the method and/or apparatus described herein. Alternatively, some or all functions could be implemented by a state machine that has no stored program instructions, or in one or more application specific integrated circuits (ASICs), in which each function or some combinations of certain of the functions are implemented as custom logic. Of course, a combination of the two approaches could be used.

Moreover, an embodiment can be implemented as a computer-readable storage medium having computer readable code stored thereon for programming a computer (e.g., comprising a processor) to perform a method as described and claimed herein. Examples of such computer-readable storage mediums include, but are not limited to, a hard disk, a CD-ROM, an optical storage device, a magnetic storage device, a ROM (Read Only Memory), a PROM (Programmable Read Only Memory), an EPROM (Erasable Programmable Read Only Memory), an EEPROM (Electrically Erasable Programmable Read Only Memory) and a Flash memory. Further, it is expected that one of ordinary skill, notwithstanding possibly significant effort and many design choices motivated by, for example, available time, current technology, and economic considerations, when guided by the concepts and principles disclosed herein will be readily capable of generating such software instructions and programs and ICs with minimal experimentation.

The Abstract of the Disclosure is provided to allow the reader to quickly ascertain the nature of the technical disclosure. It is submitted with the understanding that it will not be used to interpret or limit the scope or meaning of the claims. In addition, in the foregoing Detailed Description, it can be seen that various features are grouped together in various embodiments for the purpose of streamlining the disclosure. This method of disclosure is not to be interpreted as reflecting an intention that the claimed embodiments require more features than are expressly recited in each claim. Rather, as the following claims reflect, inventive subject matter lies in less than all features of a single disclosed embodiment. Thus the following claims are hereby incorporated into the Detailed Description, with each claim standing on its own as a separately claimed subject matter.

The invention claimed is:

1. A server comprising:

a memory configured to store printing configuration rules for interfacing with a printing system;

a communications interface;

a processor interconnected with the memory and the communications interface, the processor configured to:

generate a print system network identifier mapped to the printing system, the print system network identifier configured for identifying print parameters for print jobs by appending the print system network identifier to include a print parameter variable;

receive, via the communications interface, a print request, the print request generated based on the print system network identifier and including one or more print parameters for a print job; and

send a print instruction to the printing system to initiate the print job at the printing system according to the one or more print parameters, the print instruction generated according to the printing configuration rules.

2. The server of claim **1**, wherein the print system network identifier corresponds to a web page configured to receive the one or more print parameters for the print job.

3. The server of claim **2**, wherein, to receive the print request, the processor is configured to:

receive a request to resolve the print system network identifier;

provide, to a client device via the communication interface, the web page to receive the one or more print parameters for the print job; and

receive, via a submission request at the web page by the client device, the print request including the one or more print parameters for the print job.

4. The server of claim **1**, wherein the print request corresponds to a print job network identifier, the print job network identifier including the one or more print parameters appended to the print system network identifier.

5. The server of claim **4**, wherein, to receive the print request, the processor is configured to:

receive a request to resolve the print job network identifier; and

extract, from the print job network identifier, the print system network identifier and the one or more print parameters for the print job.

6. The server of claim **1**, wherein the processor is further configured to:

receive, from a requesting device, a network identifier request for the printing system; and

responsive to the network identifier request, provide, to the requesting device, the print system network identifier.

7. The server of claim **6**, wherein the processor is further configured to:

receive a subsequent network identifier request for the printing system;

generate a new print system network identifier mapped to the printing system, the new print system network identifier configured for identifying print parameters for print jobs; and

responsive to the subsequent network identifier request, provide the new print system network identifier.

8. The server of claim 1, wherein the processor is further configured to:

maintain, in the memory, a count of print jobs requested by an internet protocol address over a predefined time interval; and

when the count exceeds a threshold number of print jobs for the predefined time interval, disallow print requests from the internet protocol address.

9. A method comprising:

storing printing configuration rules for interfacing with a printing system;

generating a print system network identifier configured to map to the printing system, the print system network identifier configured for identifying print parameters for print jobs by appending the print system network identifier to include a print parameter variable;

receiving a print request, the print request generated based on the print system network identifier and including one or more print parameters for a print job; and

sending a print instruction to the printing system to initiate the print job at the printing system according to the one or more print parameters, the print instruction generated according to the printing configuration rules.

10. The method of claim 9, wherein the print system network identifier corresponds to a web page configured to receive the one or more print parameters for the print job.

11. The method of claim 10, wherein receiving the print request comprises:

receiving a request to resolve the print system network identifier;

providing the web page to receive the one or more print parameters for the print job; and

receiving, via a submission request at the web page by the client device, the print request including the one or more print parameters for the print job.

12. The method of claim 9, wherein the print request corresponds to a print job network identifier, the print job network identifier including the one or more print parameters appended to the print system network identifier.

13. The method of claim 12, wherein receiving the print request comprises:

receiving a request to resolve the print job network identifier; and

extracting, from the print job network identifier, the print system network identifier and the one or more print parameters for the print job.

14. The method of claim 9, further comprising:

receiving, from a requesting device, a network identifier request for the printing system; and

responsive to the network identifier request, providing, to the requesting device, the print system network identifier.

15. The method of claim 14, further comprising:

receiving a subsequent network identifier request for the printing system;

generating a new print system network identifier mapped to the printing system, the new print system network identifier configured for identifying print parameters for print jobs; and

responsive to the subsequent network identifier request, providing the new print system network identifier.

16. The method of claim 9, further comprising:

maintaining a count of print jobs requested by an internet protocol address over a predefined time interval; and

when the count exceeds a threshold number of print jobs for the predefined time interval, disallowing print requests from the internet protocol address.

17. A non-transitory computer-readable medium storing a plurality of computer-readable instructions executable by a processor, wherein execution of the instructions configures the processor to:

generate a print system network identifier mapped to the printing system, the print system network identifier configured for identifying print parameters for print jobs by appending the print system network identifier to include a print parameter variable;

receive a print request, the print request generated based on the print system network identifier and including one or more print parameters for a print job; and

send a print instruction to the printing system to initiate the print job at the printing system according to the one or more print parameters, the print instruction generated according to printing configuration rules stored in a memory.

18. The non-transitory computer-readable medium of claim 17, wherein the processor is further to:

receive a request to resolve the print system network identifier, wherein the print system network identifier corresponds to a web page configured to receive the one or more print parameters for the print job;

provide the web page to receive the one or more print parameters for the print job; and

receive, via a submission request at the web page by the client device, the print request including the one or more print parameters for the print job.

19. The non-transitory computer-readable medium of claim 17, wherein the processor is further to:

receive a request to resolve a print job network identifier, wherein the print job network identifier corresponds to the print request, the print job network identifier including the one or more print parameters appended to the print system network identifier; and

extract, from the print job network identifier, the print system network identifier and the one or more print parameters for the print job.

20. The non-transitory computer-readable medium of claim 17, wherein the processor is further to:

receive, from a requesting device, a network identifier request for the printing system; and

responsive to the network identifier request, provide, to the requesting device, the print system network identifier.

21. The server of claim 1, wherein the communication interface is configured to communicate with a client device, and the client device is configured to provide the print request.

* * * * *